

treatment of the sick is merely advertising them, which is what they want. The public is too ignorant of the fundamentals of the science to grasp the meaning. Therefore, education of the public is of prime importance, and this can be accomplished in the ways Dr. Langley has suggested: in public schools, the press, and by the individual doctor. Pressure should be brought to introduce into the schools the proper studies, and more publicity should be given to the press in an interesting and proper manner. Each one of us as physicians should take it upon ourselves to instruct our patients. All we ask of our patient now is blind faith, and blind faith is not characteristic of this age. People want to be treated as reasoning human beings. They feel it is their right to know the why and wherefore of their condition. A little time in explanation is well spent in the education of the public.

DISTURBED METABOLISM AS A BACKGROUND FOR DISEASE

By LOVELL LANGSTROTH, M. D.
(From the Department of Medicine, University of California)

We have found several therapeutic measures to exercise such a profound effect on the health of body tissue that we have been led to question whether this was not accomplished through influence on metabolic processes. Heretofore metabolism has been largely considered from the point of view of oxygen consumption and carbon dioxide production. When these fell within certain limits the metabolism was considered normal. When nutrient material in proper proportions replaced the food burned in the body the demands of metabolism were fulfilled. Now, however, we are beginning to see that various rather occult influences are working to control these processes. It has been shown, for instance, that certain substances found only in fresh food and called by Funk vitamins are necessary for normal growth and existence in animals. These must be considered as influencing the metabolism, even though, in their absence, the oxygen consumption and carbon dioxide production are normal. In the same sense, if through failure of certain controlling factors an organism gains enormously and out of all proportion to its fellows in weight, the metabolic processes must be considered abnormal. It would seem, then, as though there were several factors which influence oxidation in the body qualitatively instead of quantitatively, controlling them in such a way as to result in normal function.

The factors which have been found to influence metabolism so profoundly are food, body activity, mental activity, and sun exposure.

The question of the applicability of the newer facts regarding nutrition of animals to humans has recently been discussed by McCarrison and McCollom. It seems certain that our instincts in regard to amount and choice of food are faulty. Frequent questioning of patients has led to the belief that the diet of all those who work at manual labor, most of those occupying less lucrative positions in other walks of life, and a portion of well-to-do people is faulty in three respects: first, in excess of calories; second, in excess of artificial carbohydrates, such as starch and sugar; and third, in deficiency of such fresh foods as contain vitamins. It is very frequent to hear of breakfast made of toast, cereals and coffee; lunch made of

meat, potatoes, bread or cake, with only slight changes in regard to dinner. It is easier and cheaper to satisfy the appetite with these foods, which obviously are deficient from our new point of view. The effects of such a diet are modified by certain other factors, such as exposure to sun, exercise and psychological processes, but tend to produce degenerative diseases and a lowered resistance to bacterial infection. The degeneration appears usually throughout the organism. It is evidenced by the color and texture of the skin, the color of the sclera, the feel of the tissues, the behavior of the heart, arteries and vasomotor system, impairment in the joints and locomotor system, and functional insufficiency in the gastrointestinal tract. The nervous system should also be mentioned as profoundly influenced in such a way as to give increased irritability. Along with these degenerative changes there comes increased susceptibility to infection, beginning with such things as common coryza and ending with serious infections, such as appendicitis or cholecystitis. The degeneration and the lowered resistance appear together, so that frequently the effects of the one are laid to the other. A common age for the appearance of these changes is from 35 to 45, though of course this is influenced by the modifying factors mentioned above and by heredity. Just as in laboratory animals, proper nutrition of the preceding several generations in respect to vitamin-containing foods will result in animals having more resistance to food deficiency, so in different individuals the food of parents and grandparents will influence the age at which improper feeding will bring on these metabolic changes.

The second great factor which we have found to influence metabolic processes is bodily activity. Any consideration of proper body activity must take up, first, the efficiency of the machinery with which the exercise is to be done. It is obvious to those interested in posture that no activity without undue effort is possible to those individuals who stand in a state of ill balance, who have pronated feet, sprung knees, sway backs, prominent bellies, and forward shoulders and head. To many such mere standing is a nervous effort because of the lack of balance of enervation required in this act and complaint will be made of points of strain in the lower back or neck. Minor degrees of faulty posture will be fairly well compensated until middle age, perhaps, when the points of strain may be the sites of special localization of degenerative metabolic arthritis. Exercise implies to us balanced movement of all of the muscles of the body, which is restful and relaxing unless carried to extreme. In this sense, any work which has to be done in the sitting or stooping position with the back bent forward, the chest compressed, the diaphragm low and inactive, and the abdominal muscles relaxed, is neither restful nor relaxing, and cannot be called exercise. We believe that proper exercise in a normally balanced individual to the point where muscles, tendons, ligaments and joints are stretched and pulled, breathing and circulation are markedly quickened, and slight fatigue is felt, increases the local resistance of parts involved to both trauma and infection, and has a stimulating effect on metabolic processes throughout the body. The better bal-

anced the body, the better developed the musculature, the less will be the effort and the greater the benefit.

The results are decreased irritability of the nervous system, increase in sense of well-being and physical power, decreased fatigue in doing work, increase in speed of reaction of the vasomotor system and more normal activity of the gastrointestinal tract. The importance of proper body balance, or posture, and proper body development, or power, is emphasized by the fatigue developed when work or exercise is attempted in their absence. Fatigue is perhaps the most potent factor in lowering the resistance to infection and making apparent the functional deficiencies of various organs or of the organism as a whole. To make this clear one only has to point out the frequent gastrointestinal crises in an ill-balanced individual who has been overeating from poorly selected foods without exercise and working in a state of mental overconcentration for years. They are characterized by nausea, anorexia, headache, constipation, the syndrome called biliousness, and brought on by fatigue induced either by unusual gastrointestinal overload or unusual physical or mental strain. The important point is to consider the organism here as a whole and the fatigue state as a reaction in a bad piece of machinery to a stimulus which in a normal individual should pass almost unnoticed. In youth these individuals possess a certain reserve of strength which covers up the reaction, but as duties and responsibilities multiply this is exhausted and the symptoms of fatigue appear.

The third great factor which we have found to influence metabolism is the type of psychological reaction of the individual. When absolutely normal this allows of contact with other beings in almost any situation without sense of fear or unusual effort; it permits of the accomplishment of work without undue expenditure of energy, without overconcentration. Various degrees of abnormality make ordinary intercourse with others an effort or an agony. The habit of overconcentration is a great American fault. It results in an expenditure of energy at too high a rate; it tends to allow one problem to occupy the mind after the interval when physical contact has passed; it finally carries an individual through routine movements with his mind occupied with things entirely apart from them. The rest which comes from frequent and purposeless change of thought processes originating in sensory impressions is lost. The mind loses the power of being actively stimulated by the trivialities about it and grows weary from constant daily rehearsal of the same problems. Practically all of these abnormal psychological reactions produce their deleterious effect on the mind through the fatigue of endless monotonous repetition, and its first symptom is increased irritability of the nervous system to somatic stimuli. The expression of the fatigue is then often on a physical plane; disorganized movement of the gastrointestinal tract, loss of proper vasomotor control, increased sensibility to somatic processes and increased muscle tone and restlessness. When sleep is insufficient or fails, physical and mental degeneration rapidly follow. To mistake such manifestations for local disease of the organ in which they occur is to do the patient the greatest

possible harm, for it often prevents or makes reassurance difficult when the true cause is discovered.

A fourth factor which we consider influences metabolism is sun exposure. In this respect we may take our lesson from the history of races which live with their bodies largely exposed to the sun, or from the now well-known effects of sun exposure on experimental rickets or on the ophthalmia induced by deficiency of fat soluble A. The benefit from the sun's rays in tuberculosis must be through effects on metabolism.

I feel that each of these factors plays a large part in the metabolism of the individual, at least when we regard normal metabolism as leading to health, and abnormal metabolism away from it. Each may be said to modify the other in some way. Thus, a well-balanced muscular individual whose work consists of balanced movement in the sun and falls short of fatigue will tolerate more excess of starch and calories and less vitamin-containing food. But this same individual, working under the same conditions when confronted with mental problems which he allows to become obsessions, will show fatigue symptoms, lowered resistance and degeneration; or, an individual with moderately bad posture and the habit of overconcentration may compensate for these by proper exercise and food, but develop arthritis when the diet is deficient in vitamins or over-rich in the artificial carbohydrates and the exercise is stopped.

From a conviction of the importance of each of these factors to normal metabolism we have been led to explain the origin of many diseases on this background of disturbed metabolism. We are convinced that this plays the principal part in lowering resistance to the common non-specific infections, and by such we mean those infections which do not usually confer a lasting immunity, in contradistinction to typhoid, diphtheria, and the various exanthemata. Common colds, sinusitis, the bronchial and lung infections, the various gastrointestinal and skin infections we believe fall in this class. Such metabolic abnormalities we feel sure are at the base of such diseases as arthritis, many circulatory system degenerations, and much vague so-called functional disease.

This conception has largely influenced our therapeutic plans and enabled us to carry them out in a more fundamental way. Treatment of a disease has meant, first, establishing a background for it, determining to what extent damage has been irreparable, instituting reparative or ameliorative medical or surgical measures, and then setting about modifying the background when this has been possible. To many patients, acceptance of such a point of view is difficult because of its newness and simplicity. A sufferer from so-called hyperchlorhydria or hypersecretion, accustomed as he is to fractional gastric test meals, alkalies and bland food, will often refuse to put the responsibility on carbohydrate excess, overweight and inactivity. When it comes to a question of self-denial and persistent effort, he finds it easier to believe that his stomach needs specific treatment, which further sensitizes the nervous system to somatic stimuli. Many times the question is largely an economic one. Proper vegetables and fruits are expensive, and for many almost unobtainable. They keep poorly as compared with potatoes,

bread and sugar. Physiotherapy for the proper development of ill-balanced bodies is difficult to obtain and expensive. Telling a posture patient to go out and exercise is doing him more harm than good because of the excessive fatigue due to ill-balanced movement, and controlled exercise is essential in most cases for a considerable period of time. Treatment of the mental state is arduous, but essential for restitution of health. Temporarily, responsibilities must be lessened and the situation made simple enough that rest is obtained, but the aim should always be to build up sufficient strength and understanding to allow the individual finally to adapt himself to his environment, unless that be intolerable.

It is evident that there are stages in degenerative or infectious disease where any such methods of treatment are inapplicable because of the extent of organic change. An estimate must first be made of the degree of permanent impairment, for the treatment of an individual with a chronic nephritis and only 30 per cent of normal function will be modified by his kidney condition. In fact, the application of these principles I have found of greatest value in those who complain of headache, fatigue, the milder forms of indigestion, arthralgia, etc. In other words, in those in whom as yet there is no evidence of established disease. This is, after all, the field in which we should be most eager to get results because of the opportunity to prevent the onset of irreparable damage.

In order to show the results achieved in different types of illness the following case reports are appended:

Case I.—Mrs. B. This is the case of a woman of 42 who had an oöphorectomy and appendectomy in 1906 following divorce from her first husband. After her operation she developed left-sided weakness which was attributed to a stroke. There was a later history of loss of consciousness for two weeks following an emotional upset. After her divorce she was weak and nervous. She had a nervous breakdown in 1909. She had suffered from headaches for three years. The pain began in the back of the neck and traveled up over the head to the eyes and was accompanied by nausea and prostration. She tired easily and had been indoors at her housework practically all of her life. She weighed 170, was strongly built, but flabby and pale, and had cold hands, feet and ears. The sclerae were muddy. The tonsils were moderately enlarged. There was a faint systolic blow at the apex and base of the heart. The heart tones were feeble, the blood pressure 160/90. The abdominal wall was flabby. There were no signs of disease of the nervous system. There was considerable lumbar lordosis and a forward head, neck and shoulders. The upper dorsal and cervical spines were tender, though movement here was fair. All the laboratory examinations were negative. This woman's headaches were attributed to fatigue on the basis of weak musculature, poor posture, circulatory and vasomotor asthenia. She was given a diet containing liberal amounts of meat, milk, eggs, fruits, vegetables, cheese and nuts, with cod liver oil and yeast. No sugar or starch was allowed. Her physiotherapy was begun with vigorous general massage and baking for the neck. Breathing exercises followed, then resistive, and finally general exercises. There was prompt cessation of the headaches; the sclerae became clear, the cheeks and lips pink; the general strength gradually increased.

Case II.—Mr. F. J. This is the case of a man of 30 with asthma. He began to have persistent colds with sinusitis at 19. At 23 he developed asthma following a cold, and for two years before I saw him was short of breath and wheezy every night. Vaccines never

helped him. He had been tested for sensitivity to proteins. He showed slightly reddened tonsils, moderately bad posture, squeaky rales in his chest, a low blood pressure—105/80—and low arches. His nasal passages showed nothing abnormal. He looked tired. His laboratory work was all negative and he showed no reaction to a large number of pollens and food proteins. The bronchial spasm was attributed to persistent infection in the bronchial mucous membrane, following his attacks of coryza. These were preceded by a lowering of general resistance due to fatigue from bad posture and lack of exercise. He was kept in bed for a month to increase his resistance, and when his spasm relaxed, massage and resistive exercises were begun. The attempt was made to deepen his chest, strengthen his diaphragm, correct his posture and increase his strength. Change in his neck gradually necessitated his wearing a collar a whole size larger, and his waistcoat had to be let out about four inches. He continued having a little spasm at night for a long time, but the gymnasium work was continued and in six months he was dismissed. Two years later he was able to pass an examination for life insurance and was completely cured.

Case III.—This is the case of Mrs. P., a woman of 55 with asthma. She had had mild arthritis of her fingers for fifteen years with occasional joint pain in the left knee. Six years before, following a period of great mental strain, she caught a very bad cold, following which she developed wheezing and asthma, which lasted most of the winter. She had several bad attacks later and avoided exertion because it brought on wheezing. She showed moderate degenerative arthritis of the hands and spine, a few crackles in her lungs, a blood pressure of 155/88, but was otherwise negative. Her laboratory work was all negative. It was considered that she had a very small circulatory reserve, lowered resistance from strain and fatigue and disturbed metabolism from improper eating and lack of exercise. She was given a diet of about 1700 calories, but the artificial carbohydrate was limited to three slices of bread daily. She lost about fifteen pounds. Physiotherapy was begun at once, as she was practically free from spasm. The attempt was made to increase her vital capacity, strengthen her respiratory muscles and increase her cardiac reserve.

She improved rapidly and was able to exercise normally, but had to be very careful to avoid fatigue and take to her bed promptly at the first sign of a cold. In this way all asthma was avoided.

Case IV.—Mr. G. This is the case of a man of 41 who was referred by Dr. Franklin on account of attacks of iritis. He had always been a very heavy eater of concentrated foods, and at 25, when he stopped leading an active physical life in the open air, his weight jumped from 190 to 215. After that he had a great deal of pain from arthritis of the spine, for which he had a tonsillectomy, prostatic massage and the usual dental work. After his graduation from college at 20 he had attacks of iritis, sometimes as often as two or three a year. He had an active iritis in the right eye, which was the site of an old iridectomy. The left pupil was irregular and contracted. His hands were blue, his abdomen protuberant, and his whole spine practically rigid. His tongue was coated and his breath characteristic for individuals who eat improperly and under-exercise. All laboratory tests were negative. His arthritis and iritis were attributed entirely to improper food and lack of exercise. He was given a diet of 2000 calories with large amounts of fresh vegetables and fruits and the artificial carbohydrates limited to three slices of bread. Physiotherapy was at that time not available. In two weeks he was better, and in two months his spine was practically free from pain, though stiff; his eyes had quite cleared up and he felt better than for ten years.

Case V.—Miss H. This is a case of a woman of 38, seen in 1921 for headache and nervousness. She developed a cough in 1918 and was thought to have tuberculosis. In 1919 she went to Colfax for some months and improved. Tubercle bacilli were never found. After 1918 she was unable to work. She

suffered frequently from headaches and had pain all over her body. She never exercised, but ate a fair diet. The x-ray showed old peribronchial tuberculosis. There was no activity apparent. Under rest, over-feeding and physiotherapy she improved in three months so that she was walking several hours daily and taking very vigorous general exercises. For two years she was up and down, but never free from complaint until recently she was given a diet containing no artificial carbohydrate and large amounts of fruits and vegetables. Ultra-violet irradiation was begun every day and she soon improved very markedly in strength and felt absolutely well. Her headaches and general weakness were attributed to fatigue on the basis of lack of proper musculature, but the part that diet and sun exposure played in her treatment makes it clear that these were equally important.

SUMMARY

Restriction of the caloric intake to the approximate metabolic needs, by elimination of starch and sugar and substitution of such vitamin-containing foods as milk, fresh cooked vegetables, and raw fruits, results in increased tissue health. This is manifested by lessened fatigue, increased resistance to infection and regression of beginning degenerative processes. Exercise when carried out by an individual so balanced that it does not result in fatigue of isolated muscle groups is a powerful adjunct to proper feeding in promoting normal tissue metabolism.

Personality defects through the fatigue incident to the struggle for adjustment are powerful factors in the breakdown of resistance to fatigue and infection. Sun exposure has a stimulating and beneficial effect on tissue health.

CONCLUSION

Our experience leads us to believe that metabolism is influenced in a qualitative sense by food, exercise, personality adjustment, and sun exposure. Improper balance among these or failure of one or more of them leads to fatigue, lowered resistance to infection, and to degeneration. This state is often the background on which many disease pictures arise and a proper conception of its causes leads to a rational plan on treatment.

DISCUSSION

Franklin R. Nuzum (Santa Barbara Cottage Hospital, Santa Barbara)—Doctor Langstroth has emphasized a new viewpoint in the etiology of many common disease processes. He has emphasized the role of improper diets, overeating, lack of exercise, faulty posture and mental stress in bringing about a lowered resistance to common infections such as coryza, sinusitis, migraine, "biliousness," and such degenerative diseases as arteriosclerosis and chronic kidney and heart diseases. He reminds us that the successful treatment of these conditions means not only symptomatic aid for the prominent complaint, but educating the patient in correcting those factors which have been primarily responsible for the difficulties.

Proper diets deserve special mention in a discussion such as this. Physicians generally have been loath to giving enough attention to the study of diets, but it is not difficult to recall that at bed rest it takes but 1000 calories per day to maintain the weight and body heat of an adult. If this man sits up but four hours per day, 1500 calories supplies these needs. For the average professional person 2200 to 2400 calories are sufficient to maintain his weight and to supply him with energy. The laborer requires 4000 to 4500 calories. A sufficient bulk in this diet to insure daily bowel movements may be obtained by fresh fruits or fruit juices and a fresh or cooked vegetable at each meal. By these food constituents the neces-

sary vitamins and the mineral demands of the body are well supplied. An interesting experiment for one to try is to take two fairly comparable anemic individuals and give to one iron internally in the form of your pet prescription, and to add to the diet of the other a colored vegetable such as carrots. The increase in the per cent of hemoglobin in the second instance will convince you of the efficiency of the dietary method of treating anemia.

In addition to the fruits and vegetables that any normal diet should contain, attention should be paid to the carbohydrates, proteins, and fats. We frequently forget that in the processes of digestion 58 per cent of the proteins and 10 per cent of the fats are converted into sugar and used as such, in addition to all of the carbohydrates.

Evidence of a disturbed metabolism in such chronic conditions as arthritis and the degenerative heart, blood vessel, and kidney diseases is indicated by a study of the urine. A very high degree of urinary acidity is found to be present in these patients. It is not uncommon to find the urine of a chronic nephritic patient, for example, to be 1000 times as acid as the body fluids. Is it unreasonable to suppose that the kidney, which for years must stand the strain of excreting such acid products, finally develop degenerative changes as a result of this overwork? The highly acid urines are a result of eating acid diets—that is, diets that are largely made up of meats, fish, eggs, cereals, and bread. These acid articles should be balanced by foods which are alkaline in their reaction when metabolized in the body. These foods are the fruits, fresh and cooked, and include oranges, grapefruit, and lemons; the vegetables, and milk. Such a proper balancing of the diet results in the excretion of neutral or slightly alkaline urine.

For a long time the contention has been raised that the eating of protein (acid diets) is not responsible for the development of degenerative diseases such as arteriosclerosis and chronic nephritis, because it has not been reproduced in experimental animals. This objection no longer holds. Chronic nephritis in experimental animals has been obtained with acid diets by several investigators. I have myself obtained such results in over 100 animals by feeding diets high in protein (acid). And what is even more important, I have succeeded in obtaining an increased blood pressure in many of these animals. So far as I am aware this demonstration of increased blood pressure by "acid diets" has not heretofore been recorded. Now that these conditions have been obtained in experimental animals the objection will be raised that these are unnatural diets for these animals. The same may be said of the human animal. He has for a long time been living on a poorly balanced diet.

MORE ABOUT MIDWIVES

A recent official publication calls attention to the fact that, in the proud and modern city of Buffalo, 12,358 babies were born in 1923. Of these, 2340, or 18.94 per cent, were attended by midwives. Why? Buffalo is more than well supplied with educated physicians and hospitals, and many of the physicians are barely making a living.

What is going to happen when the federal and local "authorities" get these midwives "educated"? What is going to happen in California when ours are "educated" by a few "intensive courses" of a few days each?

Rosenow's Serum in Prevention of Paralysis in Anterior Poliomyelitis—During an epidemic of poliomyelitis in Omaha, Floyd Clarke and Andrew G. Dow (Journal A. M. A., August 9, 1924) had seventeen cases. All the patients received one or more injections of Rosenow's serum. In every instance when they were able to see the cases soon after onset, and an early diagnosis was possible, recovery was complete without paralysis.